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# COMPARISON OF RAMBOUILLET, CORRIEDALE, AND COLUMBIA SHEEP UNDER INTERMOUNTAIN RANGE CONDITIONS

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## SCOPE OF INVESTIGATION

Much work has been done by the United States Department of Agriculture in the breeding, feeding, and management of sheep. Rambouillet sheep have been kept by the Department for experimental purposes since 1906, Corriedales since 1915, and Columbias since 1913. A large part of the work with these sheep has been carried on at the United States Sheep Experiment Station, Dubois, Idaho, since 1918. The station is located approximately 7 miles northeast of Dubois in east-central Idaho, at an elevation of 5,600 feet. The conditions found there are typical of the Intermountain region. Much interest has been shown by sheep breeders and raisers in results obtained at the station, particularly with sheep produced by crossing longwool and finewool types. The question asked most frequently is, How does the production of the Corriedale and Columbia compare with that of the Rambouillet?

A considerable amount of experimental work has been conducted by various investigators in comparing the production of different types of sheep, with particular emphasis on breed type and feed tests for fattening lambs. Harper[1] gives the results of a test with several types. Among others, he uses Rambouillet and Corriedale lambs, but to the present writers' knowledge no previous experimental data have been published dealing with a comparision of the range production of the Rambouillet, Corriedale, and Columbia sheep. That no such data are available is doubtless due to the fact that Corriedales and Columbias, particularly the latter, are of more recent origin than Rambouillets and interest in them has become widespread in comparatively recent times. Comparable data on size of animals, as indicated by weight and production of wool and lambs of the Rambouillet, Corriedale, and Columbia breeds, have been compiled from records kept at the station and are presented in this circular.

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[1] Harper, C. fattening western lambs (type test). Purdue Univ. (Ind.) Agr. Expt. Sta. Bul. 343, 16 pp., illus. 1930.

## REGIONAL CHARACTERISTICS

The Intermountain region is essentially a high plateau with valleys and mountain ranges. Sheep raising is practiced to a large extent, for the region as a whole furnishes excellent grazing and the irrigated valleys produce the feed necessary to supplement the range (fig. 1).

Precipitation on the spring-fall range varies from 10 to 15 inches per year, the average at the station since 1924 being slightly over 10 inches. Much more than half of this moisture falls in the form of snow from December to April. The precipitation is normally heavier on the surrounding mountains and lighter on the desert winter ranges.

FIGURE 1.—Sheep on summer range in southwestern Montana.

## SHEEP RAISING OF THE REGION

The commercial sheep industry of the Intermountain region may be divided into three main divisions: (1) Production of purebreds, (2) production of early or shed lambs, and (3) lamb production under strictly range conditions. In point of numbers the production of purebreds is insignificant but is of importance in furnishing rams for the range producers. Shed lambing in late winter or early spring is a popular practice. There are two main reasons for this. (1) The early lamb reaches the market before the heavy fall run and thus brings a premium under normal conditions; and (2) overgrazing and inaccessibility of suitable summer range have made it necessary that the lambs be old enough when grass comes so that they can mature and finish before the lower ranges dry up in the early summer. The most popular type of ewe for use in shed-lamb production is the longwool-finewool crossbred. Ewes of this type are prolific, excellent milkers, and when mated with black-faced rams of mutton type, usually Hampshires or Suffolks, produce a very desirable market lamb. In addition, the wool produced by this crossbred ewe is long, of good weight per fleece, and sells readily on the market.

Range lambing is generally practiced where the grazing season is later and where there is no gap between the spring and summer range. Lambs are dropped on the open range during May, and as the season advances the bands are gradually worked to higher country, going on the forest reserves soon after July 1. They are grazed on the summer ranges of the national forests until weaning and then marketed in September or October. Both finewool and crossbred ewes are popular for this type of operation and they are usually bred to black-faced rams, although many Rambouillet and crossbred rams are used. Range lambing requires less equipment and labor than shed lambing but the death loss of young lambs is considerably higher.

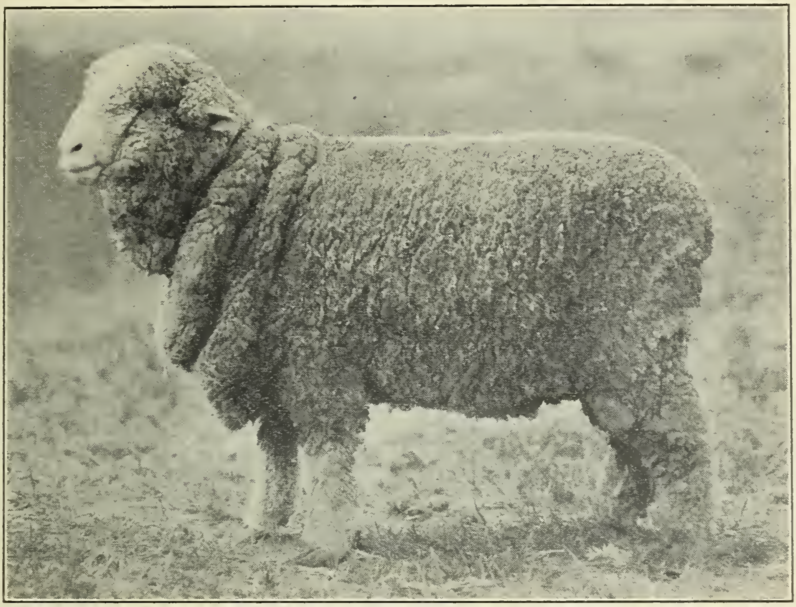

FIGURE 2.—A Rambouillet ewe of the United States Sheep Experiment Station, Dubois, Idaho. This ewe has good conformation, but the skin folds at the neck are larger than in most of the Rambouillet ewes in this investigation.

The additional practice of keeping a few sheep on irrigated farms is rapidly increasing, for farmers are realizing that sheep not only keep down weeds and increase the fertility of the land, but yield a return that compares very favorably with any of their farming operations.

## EXPERIMENTAL SHEEP

### RAMBOUILLETS

The Rambouillet sheep (fig. 2) used in this experiment have been bred by the United States Department of Agriculture since 1906. From 1906 to 1918 the experimental flock was located at Laramie, Wyo., and since 1918 at the United States Sheep Experiment Station, Dubois, Idaho.

These sheep are all purebreds, and the breeding policy has been to produce animals outstanding for mutton as well as for wool. They may be properly classed as dual-purpose sheep. The bodies of these sheep are of desirable mutton quality and the fleeces are heavy, grading chiefly half blood or fine medium and the staple is from 2 to 3 inches long. In this range region rams in breeding condition attain a weight of from 225 to 275 pounds and the ewes a weight of from 115 to 130 pounds. When mated to Rambouillet rams the ewes will raise lambs satisfactory for feeding and restocking purposes, and under some conditions part of the lambs may fatten by weaning time. When Rambouillet ewes are mated to mutton-type rams of the black-faced breeds the lambs are often satisfactory for slaughter directly from the high mountain ranges. Rambouillet ewes similar in type to those bred at the Sheep Experiment Station are the foundation for the popular crossbred range sheep when bred to rams of the longwool type, either Cotswold, Lincoln, Leicester, or Romney-Marsh. In the western range country the Cotswold is most popular for this purpose, followed by the other breeds in the order named. The foregoing facts, combined with the pronounced flocking tendency of the breed, make Rambouillets a very popular type on western ranges.

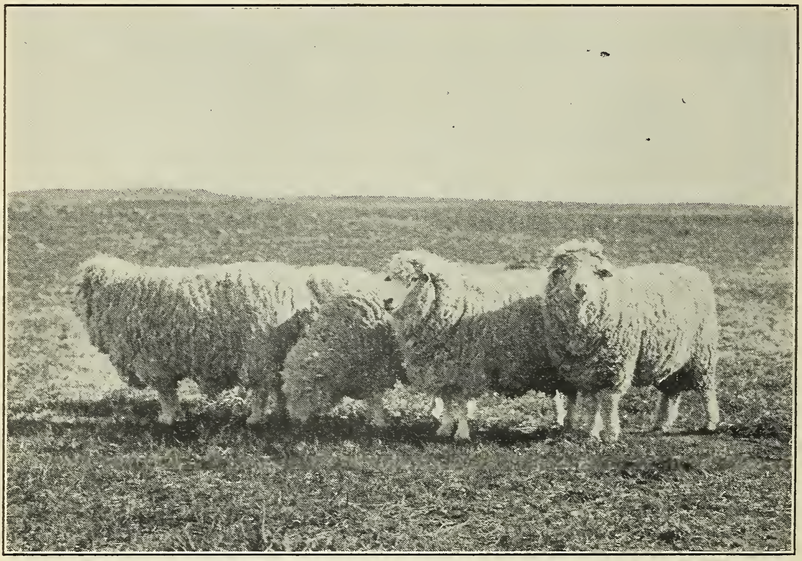

FIGURE 3.—Corriedale rams at the United States Sheep Experiment Station.

## CORRIEDALES

The Corriedale (fig. 3) is a crossbred type developed in New Zealand between 1870 and 1880 by crossing English longwool breeds on the Merino. The foundation of the present flock maintained at the Sheep Experiment Station was imported from New Zealand in 1914. Subsequent importations for the Department of Agriculture have been added to this flock, and other additions have been made through individual purchases from Corriedale breeders in the United States. These sheep have proved to be adaptable to the extremes of western range conditions, but the heavy expense of importation partly explains the limited numbers found in the Western States.

The Corriedales maintained at this station are alert, well-proportioned sheep, of medium size, with thick, compact bodies of desirable mutton comformation. In breeding condition mature rams weigh from about 175 to 225 pounds and ewes from 105 to 120 pounds. These weights are flock averages, and there is more variation, of course, among individuals. Fleeces are of medium weight, three-eighths blood quality, and from 3 to 4½ inches long. Lambs are somewhat small but mature quickly and are of desirable quality and finish when slaughtered.

### COLUMBIAS

The Columbia (fig. 4) has been developed in recent years by the United States Department of Agriculture by crossing Rambouillet ewes and Lincoln rams. At the present time the type is not absolutely fixed but variation is becoming less with each succeeding year. The Columbia is a large, vigorous, heavy-boned, hornless animal. It does not possess so good market quality as the Corriedale, nor are the lambs so quick maturing or so desirable for slaughter. Mature rams weigh from 225 to 275 pounds, and ewes from 120 to 140 pounds under range conditions found in this locality. Fleeces are heavy, quarter-blood quality, and the wool is from 3 to 4 inches long.

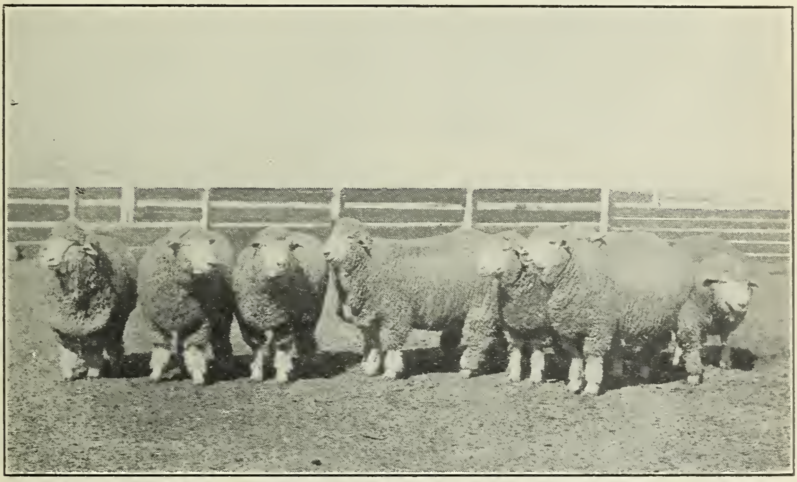

FIGURE 4.—Columbia rams at the United States Sheep Experiment Station.

### EXPERIMENTAL EQUIPMENT

In addition to the experimental animals previously described, there were available for this work all grazing land and ranch equipment necessary for the proper management of a range sheep enterprise. The range lands include an area of sagebrush-type spring-fall range near station headquarters, summer range in and adjacent to the Targhee National Forest, and a winter-range allotment in the Lemhi National Forest. Winter feed supplies of hay and grain are either shipped into the locality or obtained in the irrigated valleys of the Snake River nearby.

The ranch equipment includes fences, lambing shed, corrals, dipping vat, shearing plant, deep well, and range watering facilities for the proper management of the sheep, and housing accommodations for the personnel.

## EXPERIMENTAL PROCEDURE

An effort was made to handle these experimental sheep in a manner strictly comparable with established range practices in the region in order that the results might be applicable to the industry. The sheep and lambs used in these investigations included a yearly average of 664 Rambouillets, 426 Corriedales, and 439 Columbias. Many of the animals remained in the experiment for several years. The three different breeds of sheep were kept in the same band throughout the year, with the exception of a 30- to 40-day breeding period each fall when they were confined in adjacent pastures. By this method of handling, any differences in weight or production were due solely to inherent differences in the various breeds.

Early in October of each year all the breeding sheep were sorted, the unsatisfactory animals discarded, and the remainder made up into breeding pens. Standards of weight, type, and fleece are rigid, and all individuals falling below the desired standard were culled out and disposed of, as were also the aged and unsound ewes, and those in poor condition. The sheep retained for breeding were then divided into breeding groups of from 50 to 80 head and placed in pastures. The division was made, on the basis of individual excellence and production of wool and lamb, into first, second, third, and fourth grades. Ewes in these various groups were mated to carefully selected rams in an effort to intensify the good points of the ewes and overcome any weak points that were apparent. The constant effort was to improve the breed type, mutton conformation, and the length, weight, and density of the fleece. The band was bred to lamb in April of each year, and these ewes lambed in sheds before range feed was available. All ewes that did not get with lamb during this breeding period were herded with the unregistered band maintained at the station. This band was bred to lamb in May on the range.

During the breeding period of from 30 to 40 days, supplementary feeding of grain was often necessary to prevent a loss in weight. When the breeding period was over all ewes were combined and trailed to the winter range in the Lemhi National Forest, where they remained until feed became short or snow too deep for further grazing. Grain supplement in the form of corn or cottonseed cake was usually fed on the winter range. The rate of grain feeding varied from one fourth to one third of a pound per head per day, depending on the quality and abundance of range forage and the condition of the sheep.

When the range became short or the weather too severe for further grazing the sheep were trailed to hay on farms in the adjacent valleys. Alfalfa hay was fed on the snow at a rate of from 4 to 5 pounds per head daily until shortly before lambing. Then approximately one half pound of grain, usually oats, barley, or wheat, was added to the hay ration. This ration was continued until lambing was over and green grass was abundant enough on the range to support the ewe and lamb. As the time for lambing approached, the ewes were returned to headquarters from the winter feed lots and kept close by until lambing was over. At the time of birth of each lamb, its weight, sex, and sire were recorded. A number stamped on a metal ear tag was also assigned and attached to each lamb at birth, thus establishing and maintaining its identity throughout its life.

From the time ewes and lambs were turned on the range early in the spring until shearing, they were grazed on the spring-fall range near station headquarters. All ewe lambs were herded in a separate band from weaning until they were added to the breeding band as yearlings. After shearing and dipping operations were completed early in June (fig. 5), the band was trailed to a summer allotment in the Targhee National Forest, usually arriving there late in June and remaining until early in September when the feed on the mountains was exhausted. At this time the sheep were again brought to the spring-fall range near headquarters. Shortly before shearing all mature ewes were judged for fleece by a committee of three, and the average judgment for character of fleece and length of wool was recorded. The factor "character of fleece" consists in regularity of crimp, luster or brightness, and evenness of distribution of wool oil or grease from the inner to the outer part of the fleece or staple and throughout the various parts of that portion of the fleece which is judged for character. Yearling ewes and rams were likewise scored for fleece but in greater detail, the points considered being fineness of fleece at shoulder, side, and thigh, fleece character, fleece density, fleece length, face covering, and quantity of dirt on the back. At shearing time the weight of each fleece was accurately taken.

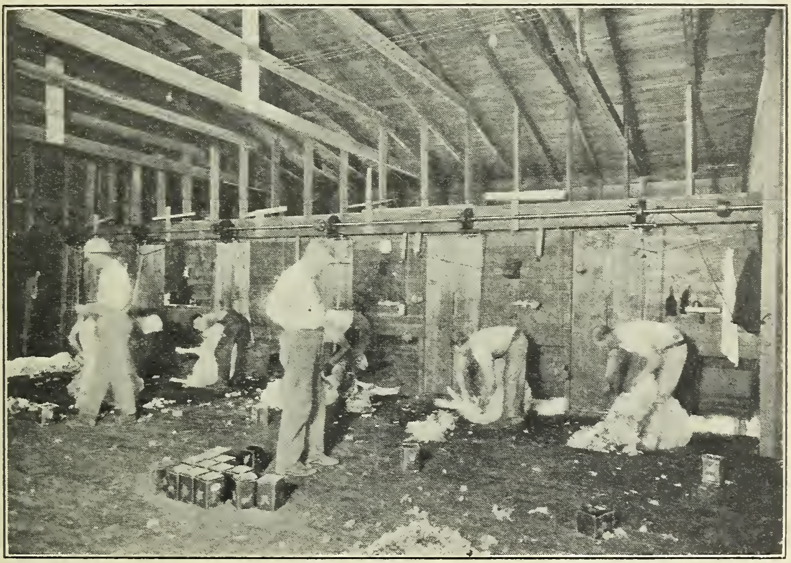

FIGURE 5.—Shearing sheep at the United States Sheep Experiment Station. The cans in the foreground were used for collecting samples of individual fleeces to be tested for percentage of clean wool.

Immediately after shearing the yearling ewes were scored in detail for body conformation by a committee of three. The points taken into consideration were type, condition, back, rump, and leg. Folds were judged on finewool sheep. Individual body weights of all ewes were taken immediately after shearing in June, at culling time in October, preceding the breeding period in November, and after breeding early in January. Lambs were weighed individually at birth, at weaning in August (fig. 6) at the time of going into the feed lots, late in December or early in January, and on their return to station headquarters from the feed lots late in April.

## EXPERIMENTAL RESULTS

The results given are intended merely to show the comparative production under range conditions prevailing for this region, and it is well recognized that they may not apply in different localities and under different growing conditions. These sheep have been maintained in bands in which consistent culling has been practiced with regard to uniformity of type, body weight and size, conformation, wool and lamb production, and age. This fact should be given consideration by anyone who plans to compare the record of performance of any of these breeds with that of animals in bands in which such culling practices have not been consistently carried out or in which the animals were not of such pure breeding.

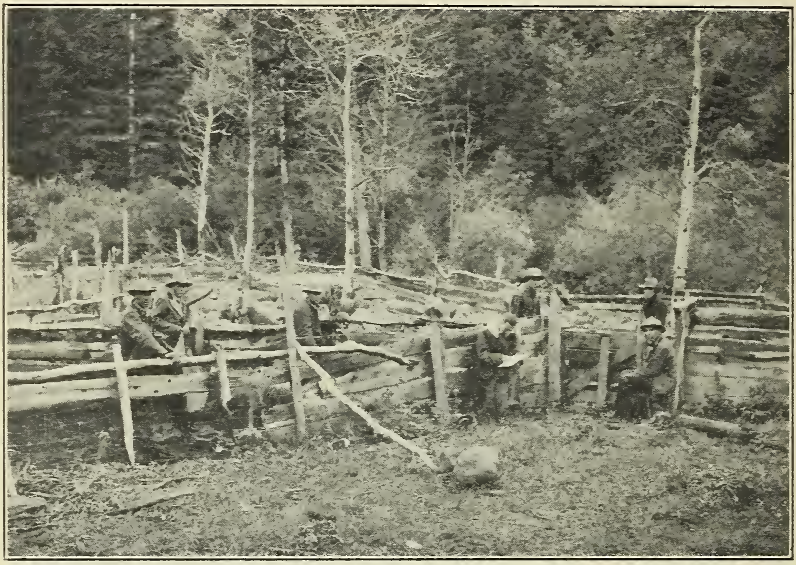

FIGURE 6.—Weighing experimental lambs on the Targhee National Forest near Spencer, Idaho. The lambs pass over the scales through a crate in which they are weighed individually. The scale beam is in front of the man seated at the extreme right. The man with the book is recording the weights.

### WEIGHTS OF MATURE EWES AND YEARLINGS

Table 1 shows the average weights, in the fall, of mature ewes of the Rambouillet, Corriedale, and Columbia breeds. Annual average weight variations within the breed reflect seasonal conditions affecting the animal, as methods of management were similar each year. Extreme variation in average weight during this period was approximately 13 pounds for Rambouillets, 16 pounds for Corriedales, and 17 pounds for Columbias.

TABLE 1.—*Average weights of mature Rambouillet, Corriedale, and Columbia ewes at the beginning of each breeding period, 1924–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes weighed | Average weight | Ewes weighed | Average weight | Ewes weighed | Average weight |
| | *Number* | *Pounds* | *Number* | *Pounds* | *Number* | *Pounds* |
| 1924 | 274 | 125.2 | 123 | 116.0 | 122 | 135.4 |
| 1925 | 309 | 124.6 | 146 | 116.9 | 138 | 132.5 |
| 1926 | 291 | 123.7 | 159 | 114.9 | 157 | 129.1 |
| 1927 | 330 | 129.0 | 184 | 121.5 | 185 | 140.5 |
| 1928 | 280 | 116.4 | 220 | 105.7 | 209 | 123.2 |
| 1929 | 277 | 125.1 | 230 | 116.7 | 230 | 135.4 |
| 1930 | 246 | 128.4 | 226 | 120.8 | 243 | 138.3 |
| 1931 | 249 | 123.0 | 220 | 116.6 | 233 | 136.4 |
| Total or average | 2,256 | 124.5 | 1,508 | 116.1 | 1,517 | 134.0 |

Fall weights of mature ewes are more comparable than weights taken at any other time of the year, since the factors of pregnancy and lamb suckling are largely absent. A comparison of the average weights for the 8-year period shows that the Corriedales were approximately 8 pounds, or 7 percent, lighter than the Rambouillets, and approximately 18 pounds, or 13 percent, lighter than the Columbias. The trend of difference was the same for the yearling ewes of these breeds (table 2); however, the variation was less between the Corriedales and the other two breeds, indicating that the Corriedale is somewhat earlier maturing.

TABLE 2.—*Average weights, immediately after shearing, of yearling ewes of the Rambouillet, Corriedale, and Columbia breeds, 1924–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes weighed | Average weight | Ewes weighed | Average weight | Ewes weighed | Average weight |
| | *Number* | *Pounds* | *Number* | *Pounds* | *Number* | *Pounds* |
| 1924 | 51 | 78.9 | 35 | 79.7 | 28 | 93.9 |
| 1925 | 92 | 81.9 | 45 | 80.8 | 42 | 92.3 |
| 1926 | 86 | 87.5 | 57 | 82.9 | 47 | 96.3 |
| 1927 | 99 | 71.6 | 55 | 71.8 | 55 | 88.0 |
| 1928 | 73 | 87.6 | 53 | 87.6 | 59 | 97.4 |
| 1929 | 106 | 79.8 | 72 | 72.5 | 61 | 80.8 |
| 1930 | 62 | 94.8 | 61 | 88.0 | 66 | 97.6 |
| 1931 | 110 | 92.7 | 76 | 82.7 | 102 | 96.0 |
| Total or average | 679 | 84.1 | 454 | 80.7 | 460 | 93.0 |

## LAMB PRODUCTION

The value of a ewe is determined by her annual production of wool and lamb. The important figure so far as lamb production is concerned is the number of pounds produced per ewe bred. This final lamb production depends on the number and average weight of lambs weaned, which in turn is dependent on the number of lambs born, the feed conditions from birth to weaning, and the inherent ability of the ewe to raise a lamb. For the present study there were available lamb-production data for the 8-year period, 1924 to 1931, inclusive. These are shown in tables 3 to 5, which give number of lambs dropped and weaned per 100 ewes, average weights of lambs at weaning time, and number of pounds of lamb produced per ewe.

### LAMBS DROPPED AND WEANED PER 100 EWES

Table 3 shows the number of lambs dropped and weaned per 100 ewes of the three breeds. All lambs dropped, whether dead or alive, are included, since in range lambing several hours may elapse between birth and observation, a fact which makes it impossible to determine, in many instances, whether some of the lambs were born dead or alive.

TABLE 3.—*Number of lambs dropped and weaned per 100 ewes of the Rambouillet, Corriedale, and Columbia breeds, 1924–31*

| Year | Rambouillet | | | Corriedale | | | Columbia | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ewes bred | Lamb production per 100 ewes | | Ewes bred | Lamb production per 100 ewes | | Ewes bred | Lamb production per 100 ewes | |
| | | Lambs dropped | Lambs weaned | | Lambs dropped | Lambs weaned | | Lambs dropped | Lambs weaned |
| 1924 | 305 | 103.6 | 81.6 | 103 | 103.9 | 91.3 | 116 | 103.5 | 76.7 |
| 1925 | 274 | 94.9 | 72.6 | 123 | 108.9 | 90.2 | 123 | 106.5 | 84.6 |
| 1926 | 310 | 119.0 | 69.4 | 150 | 117.3 | 88.0 | 142 | 112.0 | 76.1 |
| 1927 | 291 | 89.0 | 57.7 | 159 | 97.5 | 78.0 | 157 | 97.5 | 65.6 |
| 1928 | 330 | 95.2 | 78.2 | 184 | 103.3 | 86.4 | 185 | 106.5 | 84.3 |
| 1929 | 280 | 85.0 | 57.5 | 220 | 92.7 | 72.7 | 209 | 96.7 | 64.1 |
| 1930 | 277 | 98.2 | 76.2 | 230 | 97.8 | 84.8 | 230 | 112.2 | 87.4 |
| 1931 | 246 | 108.9 | 85.4 | 226 | 107.1 | 92.5 | 243 | 108.2 | 81.9 |
| Total or average | 2,313 | 99.3 | 72.2 | 1,395 | 102.3 | 84.9 | 1,405 | 105.6 | 77.9 |

A study of this table shows that in number of lambs dropped there may be great annual variation within any one breed. Condition of the ewe and ram and feed conditions before and during the breeding period were undoubtedly important factors influencing the number of lambs dropped. However, when averages for the 8 years are considered the variation among the breeds ranges only from 99 lambs for the Rambouillets to 106 lambs for the Columbias, indicating that as far as prolificacy is concerned there may not be so great a difference between Rambouillets and crossbreds, as exemplified by Columbias, as is generally believed.

In number of lambs weaned per 100 ewes annual variation was again very great within the breeds. This variation was no doubt due partly to feed conditions during the summer, but primarily to number of lambs dropped per 100 ewes. The Rambouillets again were low in number of lambs weaned, with the Corriedales weaning the greatest number.

For the three breeds the average 8-year lamb loss from birth to weaning was 24.5 percent of the lambs dropped. Although this loss appears large, it should be kept in mind that it is based on the total number of dead and living lambs dropped. The lightest lamb loss, 17 percent, occurred among the Corriedales, followed by 26.8 percent among the Columbias, the Rambouillets having the heaviest loss, 27.2 percent.

### WEIGHTS OF LAMBS AT WEANING TIME

Average weights of lambs at weaning time are shown in table 4. Annual variations in the weight of lambs within a breed were due almost wholly to range conditions during the spring and summer grazing seasons and to the number of twins weaned per 100 ewes. The summer seasons of 1926 and 1931 were very dry, and forage production for these two seasons was the poorest of any of the 8 years. These adverse feed and weather conditions materially reduced the weights of lambs.

Table 4.—*Average weights of Rambouillet, Corriedale, and Columbia lambs at weaning time, 1924–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Lambs weighed | Average weight | Lambs weighed | Average weight | Lambs weighed | Average weight |
| | *Number* | *Pounds* | *Number* | *Pounds* | *Number* | *Pounds* |
| 1924 | 249 | 74.6 | 94 | 73.6 | 89 | 81.4 |
| 1925 | 199 | 75.6 | 111 | 75.1 | 104 | 80.5 |
| 1926 | 215 | 65.0 | 132 | 66.3 | 108 | 75.1 |
| 1927 | 168 | 75.4 | 124 | 72.2 | 103 | 78.7 |
| 1928 | 258 | 71.9 | 159 | 70.9 | 156 | 77.0 |
| 1929 | 161 | 71.2 | 160 | 71.1 | 134 | 77.4 |
| 1930 | 211 | 71.3 | 195 | 67.9 | 201 | 75.7 |
| 1931 | 210 | 64.7 | 209 | 63.4 | 199 | 72.3 |
| Total or average | 1,671 | 71.2 | 1,184 | 69.3 | 1,094 | 76.6 |

At weaning time the Corriedale and Columbia lambs were slightly older, on the average, than Rambouillet lambs. The difference in age was due to the following two breed characteristics: More Corriedale and Columbia ewes became settled during the first period of oestrus, or heat, and the gestation period of the Rambouillets was slightly longer. Records kept at this station indicate that individual differences in gestation period were from 2 to 6 days. However, in a practical comparison of lamb weights at weaning time, age of lambs should not be reduced to a common factor as this slight additional age is a material advantage of the crossbred types in lamb production and should be credited to them.

### NUMBER OF POUNDS OF LAMB PRODUCED PER EWE

Table 5 shows the production in terms of pounds of lamb produced per ewe. The Columbia produced slightly more than the Corriedale and the Rambouillet averaged about 8 pounds less than the Columbia. The Columbia, therefore, made up in weight of lamb for what it lacked in number of lambs weaned per 100 ewes.

TABLE 5.—*Number of pounds of lamb produced per ewe of the Rambouillet, Corriedale, and Columbia breeds, 1924–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes bred | Pounds of lamb per ewe | Ewes bred | Pounds of lamb per ewe | Ewes bred | Pounds of lamb per ewe |
| 1924 | 305 | 60.9 | 103 | 67.2 | 116 | 62.5 |
| 1925 | 274 | 54.9 | 123 | 67.8 | 123 | 68.1 |
| 1926 | 310 | 45.1 | 150 | 58.3 | 142 | 57.1 |
| 1927 | 291 | 43.5 | 159 | 56.3 | 157 | 51.7 |
| 1928 | 330 | 56.2 | 184 | 61.3 | 185 | 65.0 |
| 1929 | 280 | 40.9 | 220 | 51.7 | 209 | 50.0 |
| 1930 | 277 | 54.3 | 230 | 57.6 | 230 | 66.2 |
| 1931 | 246 | 55.2 | 226 | 58.7 | 243 | 59.2 |
| Total or average | 2,313 | 51.4 | 1,395 | 58.9 | 1,405 | 59.7 |

### MARKET SUITABILITY

The station's summer ranges on which these Corriedale, Columbia, and Rambouillet lambs were grazed from shortly after shearing until weaning, are typical of the summer ranges of the region on which fat market lambs are produced. All lambs from the three breeds compared in this discussion were used for restocking purposes and none were placed directly on the market for slaughter. However, from close observation over a period of years and actual marketing figures obtained from unregistered Rambouillet and Corriedale lambs of the same blood lines, the following facts have been obtained with respect to their market suitability.

Rambouillet lambs produced at the sheep experiment station have not finished sufficiently to be accepted by packer buyers as slaughter lambs direct from the range at 4½ to 5 months of age. During the period covered by this experiment shipments of Rambouillet lambs went to market each fall and were almost always sent to feeders for further finishing before being accepted for slaughter. A small number were slaughtered, but this was due to abnormal conditions of price and demand and when the quality of the finished product was not of so much importance.

Because of its relatively small size, quick maturity, smooth compact carcass conformation, uniform quality of finish, and relatively high dressing percentage, the Corriedale lamb was highly acceptable as a killer lamb from the packer standpoint. The percentage of fat Corriedale lambs also compared favorably with lambs sired by rams of the black-faced mutton breeds.

Despite its large size and ability to make rapid gains on good feed the Columbia was not so desirable for slaughter lambs as the Corriedale. This was due to its slower maturity, less blocky conformation, and lack of uniformity in finish. The Columbia falls between the Corriedale and Rambouillet with respect to its desirability as a slaughter lamb direct from the range.

### WOOL PRODUCTION

The data in tables 6 to 9 on wool production of the three types of sheep are based on weights and on measurements taken immediately preceding and during shearing. Length of staple was determined by measuring with a rule the length of the unstretched wool at the middle of the side. It had previously been determined that the length of staple at the side is nearer the average length of the fleece as a whole than any other single measurement. The figures in these tables represent approximately 365 days' growth for ewes 2 years old and older, 427 days' growth for Rambouillet yearling ewes, and 430 days' growth for Corriedale and Columbia yearling ewes, although there was 1 or 2 days' variation in average shearing dates from year to year.

### FLEECE WEIGHTS OF MATURE EWES AND YEARLINGS

Table 6 shows the average fleece weights of mature Rambouillet, Corriedale, and Columbia ewes for the 8-year period.

TABLE 6.—*Average grease wool production [1] of mature Rambouillet, Corriedale, and Columbia ewes, 1924–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes sheared | Average fleece weight | Ewes sheared | Average fleece weight | Ewes sheared | Average fleece weight |
| | *Number* | *Pounds* | *Number* | *Pounds* | *Number* | *Pounds* |
| 1924 | 184 | 12.11 | 104 | 9.52 | 98 | 11.64 |
| 1925 | 219 | 11.26 | 118 | 9.38 | 109 | 11.53 |
| 1926 | 279 | 9.99 | 145 | 8.19 | 139 | 9.88 |
| 1927 | 325 | 11.27 | 171 | 8.68 | 158 | 10.66 |
| 1928 | 316 | 12.35 | 177 | 9.59 | 176 | 11.46 |
| 1929 | 291 | 11.33 | 209 | 8.92 | 194 | 11.08 |
| 1930 | 270 | 11.80 | 217 | 9.55 | 215 | 11.46 |
| 1931 | 237 | 14.05 | 218 | 12.06 | 233 | 14.57 |
| Total or average | 2,121 | 11.72 | 1,359 | 9.59 | 1,322 | 11.71 |

[1] Represents approximately 365 days' growth.

During the 8-year period the Rambouillet and Columbia ewes yielded approximately the same quantity of wool, but the Corriedale ewes yielded considerably lighter fleeces. Fleece weights of yearling ewes of the three breeds are shown in table 7.

TABLE 7.—*Average wool production of Rambouillet, Corriedale, and Columbia yearling ewes, 1924–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes sheared | Average fleece weight [1] | Ewes sheared | Average fleece weight [2] | Ewes sheared | Average fleece weight [2] |
| | *Number* | *Pounds* | *Number* | *Pounds* | *Number* | *Pounds* |
| 1924 | 51 | 9.15 | 35 | 9.44 | 27 | 9.87 |
| 1925 | 89 | 11.27 | 45 | 10.94 | 46 | 12.37 |
| 1926 | 84 | 11.65 | 59 | 10.93 | 44 | 11.79 |
| 1927 | 101 | 10.70 | 56 | 10.75 | 57 | 11.29 |
| 1928 | 73 | 12.99 | 62 | 11.50 | 58 | 12.57 |
| 1929 | 105 | 12.02 | 74 | 11.11 | 61 | 11.83 |
| 1930 | 62 | 11.39 | 61 | 10.90 | 67 | 11.58 |
| 1931 | 113 | 12.95 | 77 | 12.63 | 105 | 13.29 |
| Total or average | 678 | 11.66 | 469 | 11.18 | 465 | 12.09 |

[1] Represents approximately 427 days' growth.
[2] Represents approximately 430 days' growth.

It should be kept in mind that the fleeces of which the weights are given were grown on the range, and that under farm conditions more favorable to wool production fleece weights would be considerably greater.

Wool production responds to favorable feed and weather conditions in much the same manner that body weights respond to the same favorable conditions. This is forcibly illustrated by the 1931 wool production of the three breeds. The season of 1930 was above the average for range-feed production, particularly throughout the late summer and fall. There followed an early winter that forced the sheep into the feed lots in December, thus avoiding a 45- to 60-day period on the winter ranges where sheep lose condition each year. The spring of 1931 was average or better for the production of range forage. Under these conditions all sheep were in excellent physical condition when the 1931 wool clip was growing, and as a result this wool was better grown and heavier than in any other year on record.

In wool-scouring studies carried on in 1921 to 1924, inclusive, the average clean-wool content of all Rambouillet fleeces was 41.23 percent, of the Corriedale 48.78 percent, and of the Columbia 50 percent. Despite the relatively heavy weight of the Rambouillet unscoured fleece, the clean-wool content is only moderate because of the presence of large quantities of grease and dirt in the unscoured fleece. On the basis of these percentages the clean-wool yield for all the fleeces of the mature Rambouillet ewes was 4.83 pounds per fleece, for all mature Corriedale ewes 4.68 pounds, and for all mature Columbia ewes 5.86 pounds. Similarly the clean-wool yield of all the yearling fleeces was 4.81 pounds for Rambouillet ewes, 5.45 pounds for Corriedale ewes, and 6.05 pounds for Columbia ewes.

### LENGTH OF WOOL STAPLE OF MATURE EWES AND YEARLINGS

Table 8 shows the average length of staple, at the middle of the side, of the fleeces of mature ewes for the 7-year period, 1925 to 1931, inclusive. The average length for the Rambouillets was 2.33 inches, which is slightly less than the strictly combing length acceptable to most commercial wool dealers. However, it is well above the minimum combing length standard established by the Bureau of Agricultural Economics of the United States Department of Agriculture. Lengths of the Corriedale and Columbia fleeces were nearly the same, averaging 3.41 and 3.44 inches, respectively. Most of the wool produced by the Rambouillet ewes graded fine medium (64's) and half blood (58's and 60's), by the Corriedale ewes largely three-eighths blood (56's), and by the Columbia quarter blood (48's and 50's).

TABLE 8.—*Length of wool staple*[1] *of mature Rambouillet, Corriedale, and Columbia ewes, 1925–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes | Average length of staple | Ewes | Average length of staple | Ewes | Average length of staple |
| | *Number* | *Inches* | *Number* | *Inches* | *Number* | *Inches* |
| 1925 | 219 | 2. 29 | 114 | 3. 51 | 116 | 3. 48 |
| 1926 | 288 | 2. 22 | 141 | 3. 36 | 139 | 3. 41 |
| 1927 | 320 | 2. 26 | 169 | 3. 23 | 155 | 3. 26 |
| 1928 | 313 | 2. 42 | 175 | 3. 50 | 174 | 3. 50 |
| 1929 | 292 | 2. 31 | 210 | 3. 34 | 197 | 3. 40 |
| 1930 | 268 | 2. 36 | 218 | 3. 29 | 216 | 3. 30 |
| 1931 | 239 | 2. 46 | 217 | 3. 64 | 236 | 3. 66 |
| Total or average | 1, 939 | 2. 33 | 1, 244 | 3. 41 | 1, 233 | 3. 44 |

[1] Represents approximately 365 days' growth.

The average length of staple at the middle of the side of the fleece of yearling ewes for the period 1925 to 1931, inclusive, is shown in table 9. The Corriedale yearling ewes had the longest staple and the Rambouillet ewes the shortest. Table 8 shows that wool produced by mature Columbia ewes was slightly longer than that of mature

Corriedales. The Corriedale yearlings however (table 9) produced wool approximately one third inch longer than that of the Columbia yearlings.

TABLE 9.—*Length of wool staple of Rambouillet, Corriedale, and Columbia yearling ewes, 1925–31*

| Year | Rambouillet | | Corriedale | | Columbia | |
|---|---|---|---|---|---|---|
| | Ewes | Average length of staple [1] | Ewes | Average length of staple [2] | Ewes | Average length of staple [2] |
| | *Number* | *Inches* | *Number* | *Inches* | *Number* | *Inches* |
| 1925 | 91 | 2.55 | 46 | 4.21 | 46 | 3.86 |
| 1926 | 85 | 2.51 | 57 | 4.02 | 45 | 3.67 |
| 1927 | 99 | 2.62 | 54 | 4.05 | 55 | 3.67 |
| 1928 | 73 | 2.67 | 52 | 4.12 | 59 | 3.84 |
| 1929 | 103 | 2.64 | 73 | 4.04 | 61 | 3.76 |
| 1930 | 60 | 2.56 | 61 | 4.10 | 67 | 3.79 |
| 1931 | 112 | 2.64 | 77 | 4.40 | 103 | 3.91 |
| Total or average | 623 | 2.60 | 420 | 4.14 | 436 | 3.80 |

[1] Represents approximately 427 days' growth. [2] Represents approximately 430 day's growth.

A study of tables 6 and 8 indicates that there was a marked correlation within the breed between fleece weight and fleece length. In years when heavy fleeces were produced there also seemed to be a tendency toward greater length of staple.

### LOSS OF MATURE EWES

The data in table 10 show the average loss of mature ewes, including dead and missing animals, for the three breeds from 1926 to 1931, inclusive. In arriving at these figures all ewes of each of the three breeds were counted at shearing time, the number culled was subtracted, and the difference between the remainder and the number on hand the following year at shearing represented the loss.

TABLE 10.—*Percentage of dead or missing mature ewes of the Rambouillet, Corriedale, and Columbia breeds, 1926–31* [1]

| Year | Rambouillet | Corriedale | Columbia | All ewes |
|---|---|---|---|---|
| 1926 | 7.62 | 8.00 | 7.30 | 7.64 |
| 1927 | 6.86 | 7.57 | 7.18 | 7.12 |
| 1928 | 3.14 | 5.83 | 6.60 | 4.71 |
| 1929 | 3.85 | 5.16 | 8.94 | 5.79 |
| 1930 | 9.51 | 10.97 | 14.71 | 11.39 |
| 1931 | 7.58 | 8.33 | 6.34 | 7.48 |
| Average | 6.27 | 7.80 | 8.65 | 7.32 |

[1] Based on number of ewes lost per 100 ewes sheared. Annual period covered is from shearing date of previous year to shearing date of year given.

### SUMMARY AND CONCLUSIONS

The investigations were conducted with an annual average of 664 Rambouillet, 426 Corriedale, and 439 Columbia sheep and lambs, for the 8-year period 1924–31, at the United States Sheep Experiment Station, Dubois, Idaho.

In body weight, at the beginning of the breeding period in the fall, the mature Rambouillet ewes ranged from 116 to 129 pounds, Corriedales from 106 to 122 pounds, and Columbias from 123 to 141 pounds. After shearing in the spring, Rambouillet yearling ewes weighed from 72 to 95 pounds, Corriedales from 72 to 88 pounds, and Columbias from 81 to 98 pounds.

In number of lambs per 100 ewes, Rambouillets gave birth to approximately 99, Corriedales to 102, and Columbias to 106. Of these lambs, the Rambouillets weaned approximately 72, the Corriedales 85, and the Columbias 78. At weaning the Rambouillet lambs averaged approximately 71 pounds, the Corriedale lambs 69 pounds, and the Columbia lambs 77 pounds.

In number of pounds of lamb per ewe bred, the Rambouillets averaged approximately 51, the Corriedales 59, and the Columbias 60. The Rambouillet produced the smallest number of pounds of lamb per 100 ewes because of the small number of lambs weaned. The production of the Corriedale was high because of the large number of lambs weaned, and the Columbia was high because of the relatively high weaning weight per lamb.

In quantity of grease wool per ewe, mature Rambouillets averaged 11.72 pounds of fine-medium and half-blood quality, the Corriedales 9.59 pounds of three-eighths-blood quality, and the Columbias 11.71 pounds of quarter-blood quality. Yearling Rambouillet ewes averaged 11.66 pounds, Corriedales 11.18 pounds, and Columbias 12.09 pounds.

Average length of staple of the wool grown by mature Rambouillet ewes was 2.33 inches, by Corriedale ewes 3.41 inches, and by Columbias 3.44 inches. Average length of staple of the wool grown by yearling Rambouillet ewes was 2.60 inches, by Corriedale ewes 4.14 inches, and by Columbias 3.80 inches. In terms of clean wool the yield for mature Rambouillet ewe fleeces was 4.83 pounds, Corriedale fleeces 4.68 pounds, and Columbias 5.86 pounds. Similarly, the clean yield of yearling Rambouillet fleeces was 4.81 pounds, Corriedale fleeces 5.45 pounds, and Columbia fleeces 6.05 pounds.

In percentage of dead or missing ewes the Rambouillet loss was 6.27, the Corriedale loss 7.80, and the Columbia loss 8.65. The percentage of lamb loss from birth to weaning was 27.2 for the Rambouillets, 17.0 for the Corriedales, and 26.8 for the Columbias.

Under range conditions at the United States Sheep Experiment Station, Rambouillets are large, vigorous sheep, producing lambs that are desirable for stocking and feeding purposes, and fleeces of fine or half-blood wool, moderate in length of staple and yield of clean wool. Corriedales also have been found to be well adapted to the range conditions of this region. They are of only moderate size but produce lambs that are in good demand for restocking, slaughter, and feeding purposes. Their fleeces are of staple length, of moderate weight when unscoured, but relatively heavy in clean wool and are predominantly of three-eighths-blood grade. Columbias are especially large, rugged sheep producing rapidly growing lambs that finish at rather heavy weights, making them particularly well adapted to good feed conditions that prevail on many of the high summer ranges, but less suited to sparse ranges where the lighter weight feeder lambs are better adapted. The Columbia fleeces are of staple length, heavy, both unscoured and clean, and the predominating fineness is quarter blood.

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